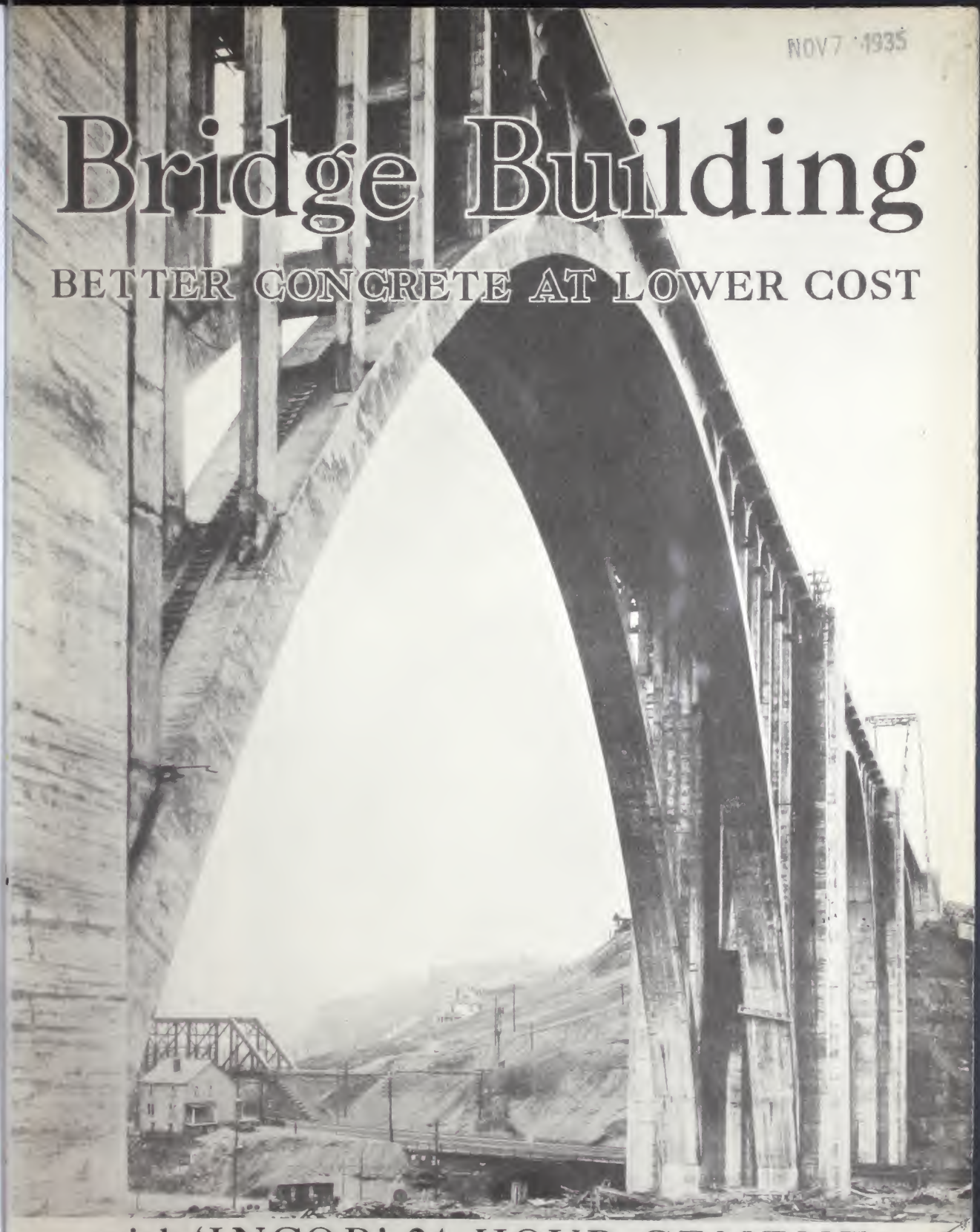
Bridge Building

BETTER CONCRETE AT LOWER COST



with 'INCOR' 24-HOUR CEMENT

CONTRACTOR SAVED $70,000· George Westinghouse Bridge, 5-span reinforced concrete structure, 1520′ long, carries Lincoln Highway across Turtle Creek Valley near Pittsburgh, Pa. 460′ center span is America's longest concrete arch. (Left, span under construction; cover, finished structure.)

Used in key sections of all arch ribs, 'Incor' gained sufficient strength in 12 hours to withstand stresses due to effects of temperature change upon steel false-work. Steel centering removed in 3 days —instead of 12 to 14 days—saved 10 days on each of 10 arch ribs, 100 days in all. $700 of contractor's daily fixed payroll was non-productive while arch-rib concrete cured. So 'Incor' saved $70,000.

Bridge Building

Concrete now a "ready-to-use" material. Dependable high-early strength means lower construction costs. . . . Stronger, denser, more watertight concrete, too.

FOREWORD

Squire Whipple's famous treatise on the computation of stresses marked the beginning of modern bridge building. That was less than a century ago. In no other field of construction has greater progress been made in so short a time.

Progressive improvement in structural materials has helped pave the way for advancing skill of designer and constructor. Cement is a case in point:

First came natural cement. The slow strength-gaining characteristics confined its use to structures dependent upon mass and weight for stability.

Then came Portland cement. It quickly displaced natural cement, because it substituted strength and lightness for mass. The handicap of lost time while concrete acquired service strength was steadily lightened through the manufacture of a progressively better product.

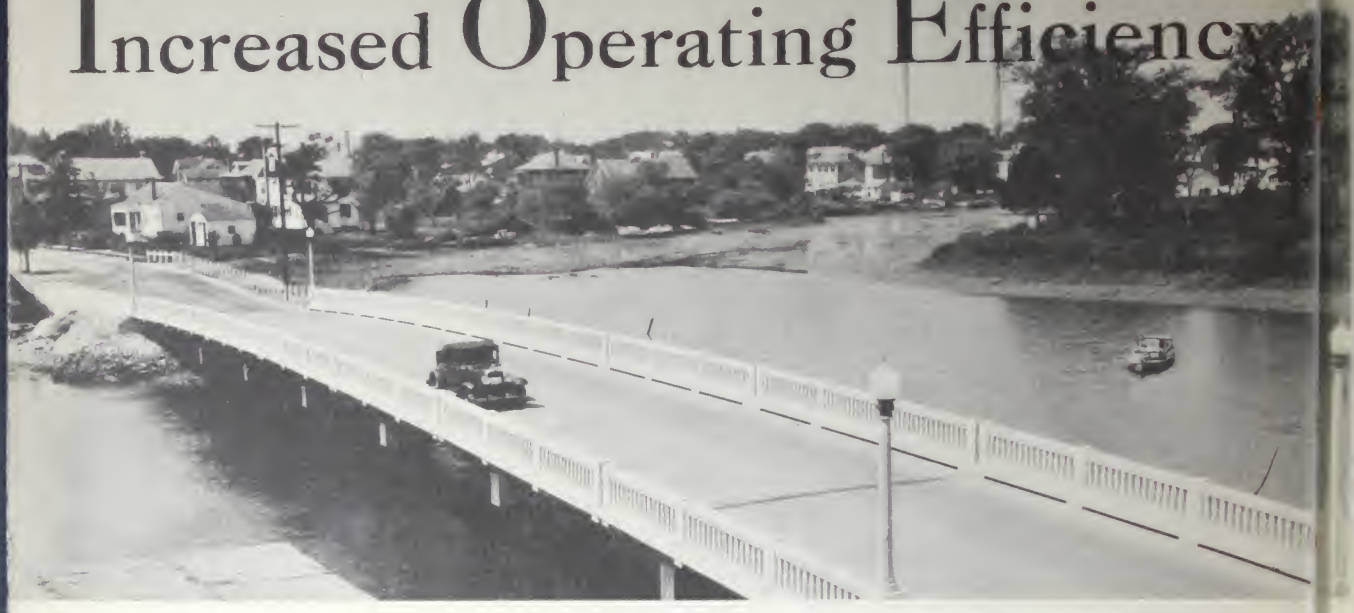
Now 'Incor' 24-Hour Cement makes concrete a ready-to-use material. 'Incor' cures or hardens in one-fifth the usual time—so concrete is self-supporting in 24 to 48 hours. As a result, new ideas, new construction schedules are steadily crowding out the old. Far-reaching economies are realized.

Nine years' experience with 'Incor' in bridge building, summarized on the following pages, shows how—

1. 'Incor' lowers costs, speeds turnover, increases profits—by eliminating the unproductive time while concrete hardens;
2. 'Incor' makes better concrete—by curing *thoroughly* in the short time concrete can be kept wet under job conditions.

These facts amply justify the suggestion to estimate 'Incor' on your next job—figure 'Incor' side by side against ordinary Portland cement—and may the 'best man' win!

Increased Operating Efficiency



JOB progress is directly affected by the time it takes concrete to become self-supporting. As that time interval is shortened, operating efficiency is increased.

Because it is a better Portland cement, 'Incor' cures or hardens in one-fifth the usual time. Result, 'Incor' concrete is self-supporting in 24 to 48 hours instead of 5 to 10 days. That means five economies:

1. *Lower Labor Cost:* 'Incor' enables the contractor to make more efficient use of labor. Concreting is practically a continuous operation. Labor is no longer laid off, or shifted to other work, while concrete hardens.

Thus, one gang goes right ahead with concreting while another concentrates on form erection, stripping and re-erection. There is no waste-motion stopping one operation and picking up another; each man does the work for which he is best fitted.

When concrete is placed almost daily, the concrete gang works steadily with no layoffs. The same applies to men bending and placing reinforcing steel. In the case of straight-time men, the saving is obvious. Hourly men learn to do one job and do it well.

These are some of the important elements in that intangible but vitally important factor—'labor costs'; they are well worth calculating on any job. 'Incor' reduces labor costs by increasing man-hour production.

2. *Placing Costs Reduced:* Because it is a more thoroughly processed Portland cement,

Foundations of Baltimore's Hanover St. Bridge over Patapsco River had to be renewed. New piling was driven around the old, water pumped out and an 'Incor' pile cap placed, on which an 8′ x 12′ reinforced footing was erected and the cut column section replaced. By using 'Incor', column shores were removed in 24 to 48 hours, even in Winter. Pumping expense was reduced—stronger, denser, more watertight concrete obtained. Job completed weeks earlier, reducing high-water hazard.

Contractor for the Darling Bridge (left), Hampton, Va., figured 'Incor' 24-Hour Cement against ordinary Portland. Result, 'Incor' was used exclusively. His actual costs were $300 less than his estimate with ordinary cement.

Triple 8' x 8' reinforced concrete culvert (right) at Alexandria, La., built of 'Incor' concrete to expedite back-filling and speed up grading operations. Walls and wings were poured one day, top slabs next day; 24 hours later, forms were struck. Grading began 10 days sooner—forms were quickly available for reuse on other structures. Engineer says: "Results were excellent—workability and plasticity were evidenced by lack of any honeycombing. Rubbing down with carborundum brick gave finish like white marble."

'Incor' makes a smoother-working concrete. Result, an 'Incor' mix of any given consistency is easier to place. Costs are lowered because it takes less effort to work 'Incor' concrete into place. Better concrete is obtained, because it isn't necessary to add excess mixing water to secure workability.

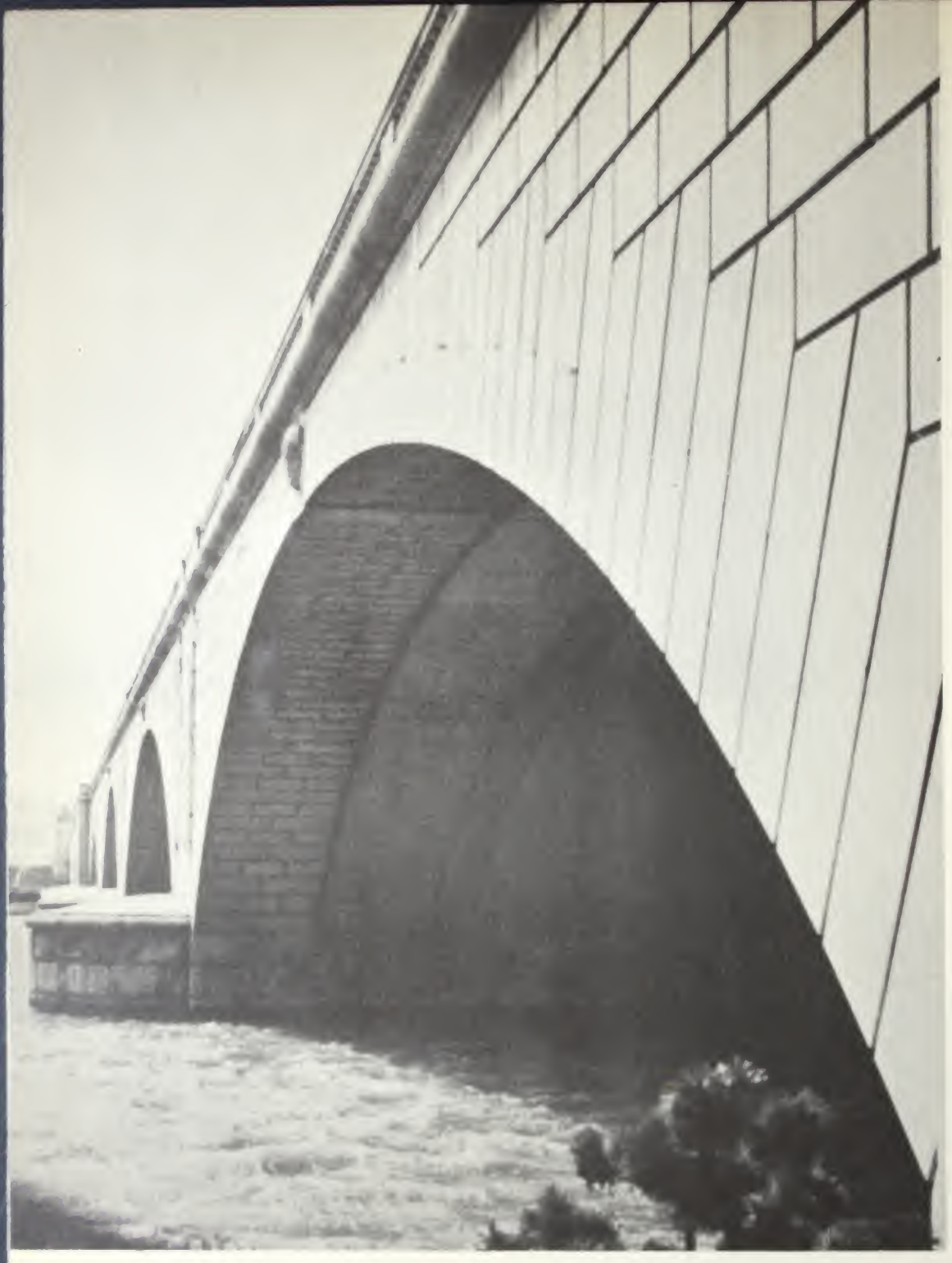
'Incor' holds a concrete together better—it is easier to handle without separation. In placing by towers and chutes, 'Incor' makes it possible to use a plastic mix, instead of one that is wet and sloppy.

3. *Faster Follow-Up Operations:* The quicker concrete attains service strength, the sooner follow-up operations begin. 'Incor' concrete is placed one day—next morning, workmen can use the freshly-placed surface. Subsequent operations follow without delay.

Example: Excavated material is often needed for 'fill' on the other side of a bridge or culvert. Hauling begins over an 'Incor' structure 24 to 48 hours after concreting. Shovel crews are no longer held up waiting for concrete to harden.

4. *Fewer Shut Downs:* The longer it takes to finish a job, the greater is the risk of shut

Suspension Bridge across Rio Grande between Hidalgo, Texas, and Reynosa, Mexico, was damaged when floods deepened the channel close to the American side, causing a pier to fail suddenly. Concrete foundation piles made with 'Incor' Cement were driven within 5 days after pouring—23 days sooner than possible with ordinary cement. Bridge re-opened 6 weeks sooner.



Arlington Memorial Bridge, Washington, D. C., where 'Incor' Cement, used in key-ways, made it possible to release forms 10 days sooner. More frequent form re-use meant substantial savings. In 10 or 12 hours, 'Incor' concrete was strong enough to resist movement of steel falsework due to temperature change—avoiding serious structural hazard. At one and two days, "Incor" provided strengths equal to 10 days with rich-mix ordinary concrete.

downs due to weather or other causes. Rapid curing with 'Incor' reduces shut downs by at least a third. This means reduced damage risk, lower overhead for the contractor and steadier work for labor.

In cold weather, concreting often has to be shut down after each pour while concrete hardens. For days at a time, nobody works except the man tending the fires. With 'Incor', the job goes ahead every day men can work outside.

5. *Quicker Turnover:* A contractor is paid for the materials he puts in place—the sooner materials are ready for use, the quicker he gets off the job and receives his money.

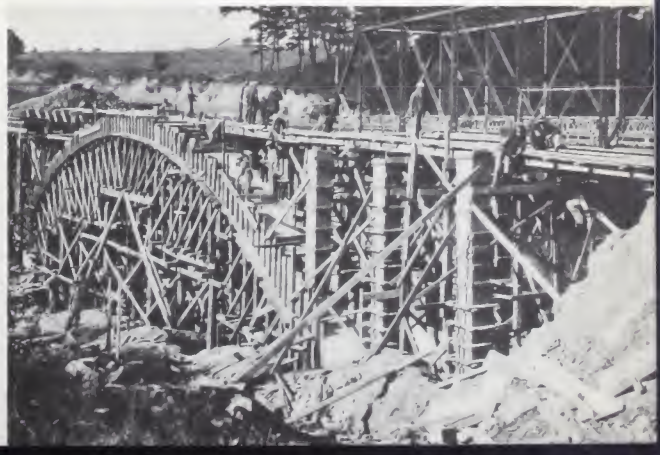
By advancing concreting and follow-up operations, 'Incor' makes possible earlier cash realization on job estimates, not only for concreting, but for related operations as well. A greater volume of work can be done with a given amount of working capital.

With 'Incor', equipment can be moved to the next job days and often weeks sooner. That means a substantial increase in output with a given investment in equipment.

In short, by eliminating the unproductive time while concrete hardens, 'Incor' lowers costs, speeds turnover and increases profit.

Boston & Maine R. R. Bridge (above) over Connecticut River, White River Junction, Vt. Seats were placed on 'Incor' piers 24 hours after last concrete was poured. Photo shows girder about to be lowered, 12 hours after placing seats. Contractor saved lost time while concrete hardened. 'Slow order' operation ended 2 weeks sooner.

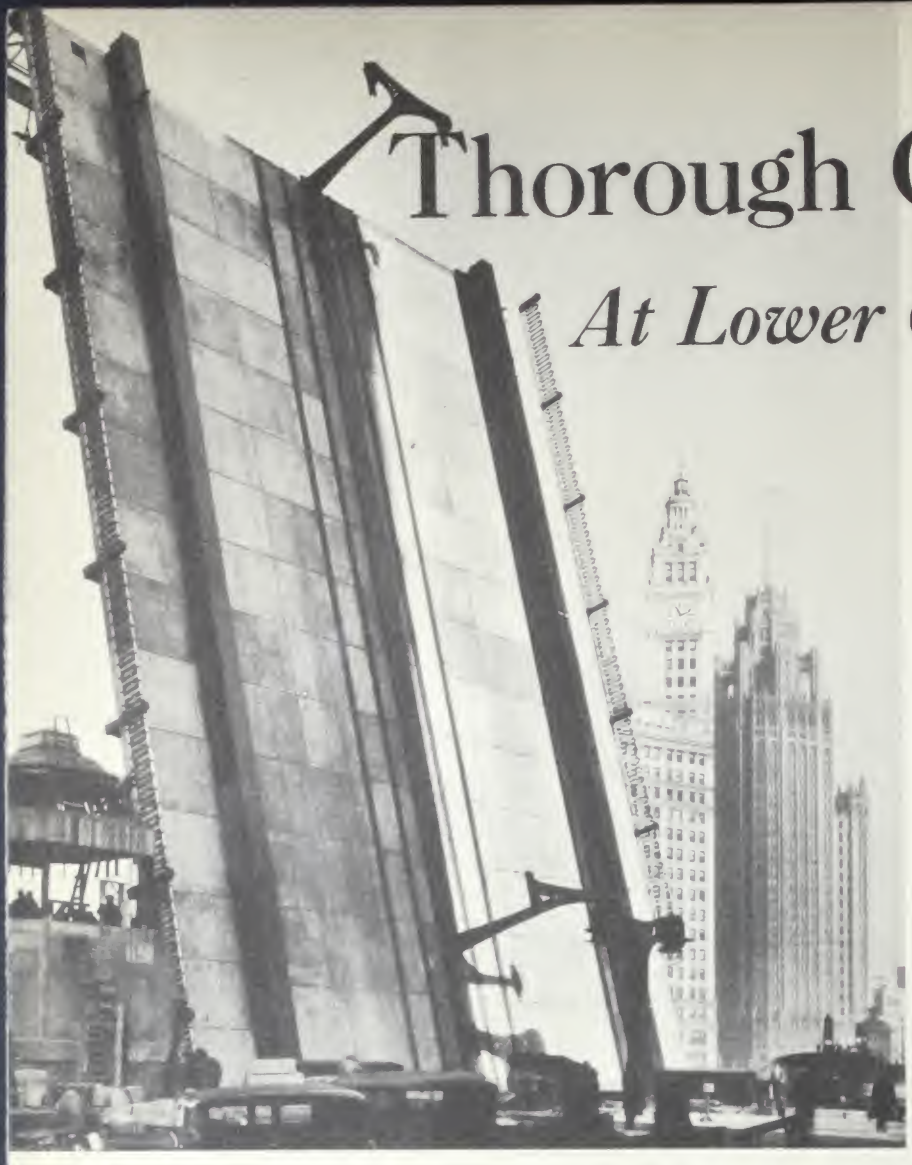
International Gateway Toll Bridge (below) spans Rio Grande between Brownsville, Texas, and Matamoras, Mexico. 'Incor' was used for last pier, one retaining wall, bridge floor and approaches. Bridge was opened to traffic 20 days sooner than possible with ordinary cement. That meant $5,000 additional toll revenues ($250 a day). Floods washed out all false-work 48 hours after the 'Incor' floor was placed. 'Incor' avoided that hazard.



Work fell a month behind in erecting 100′ arch bridge over Brindley Creek, Cullman, Ala. Penalty clause, mounting overhead and approaching rainy season caused contractor to shift to 'Incor', which was used exclusively in ribs and superstructure. Rib sections were placed in succession, closely followed by keys. Centering was struck in 3 days; erection of columns, deck slab and hand-rail followed without delay. Result, an $1800 cash saving.

Thorough Curing

At Lower Cost



'Incor' was used for pre-cast sidewalk and roadway slabs for double-leaf Bascule bridge over Chicago River at Wabash Ave. Results: (1) Forms used twice a day, saving 50%; (2) Service strengths in 8 to 10 hours; 3400-lb. compressive strength in one day; (3) Concrete slabs measuring 12′ x 8′ 6″, only 5¾″ thick, piled by crane 8 to 20 hours after casting.

Concrete had to be dense and watertight—moisture absorption would affect balance between leaves and counterweights. Five years' exposure has had no effect on span's delicate balance. 'Incor' produces watertight concrete with only 24 to 48 hours' curing.

CONCRETE hardens and attains strength by a chemical reaction requiring *both* cement and water. If allowed to dry out before curing is well advanced, strength, durability and watertightness are impaired.

To get really good concrete with ordinary Portland cement, you have to keep it wet 5 to 10 days, depending upon the type of work. But how many jobs get that much curing?

'Incor' combines with water five times as fast as ordinary Portland cement. That means thoroughly cured concrete in 24 to 48 hours instead of 5 to 10 days. By curing thoroughly in the limited time concrete can be kept wet under actual job conditions, 'Incor' produces stronger, denser, more durable concrete.

There's an important money-saving, too: It costs money to keep concrete wet; labor is required for covering and sprinkling; pipe lines and pumping equipment are often necessary. Where traffic is encountered, barricades, watchmen and lights have to be maintained. On railroad structures, 'slow order' operation is costly and disrupts service.

'Incor' minimizes all of these cost factors, by doing away with 75% to 80% of the curing

operation—at the same time making it ever so much easier to get thoroughly-cured concrete.

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Winter concreting

In Winter it is difficult to heat concrete and at the same time give it the required amount of moisture. That is why Winter-placed concrete often dries out too soon.

'Incor' needs shorter heat-curing periods. That not only saves 60% to 75% on heating costs, but it also reduces the risk of dried out concrete—another reason why 'Incor' helps to produce better-quality work.

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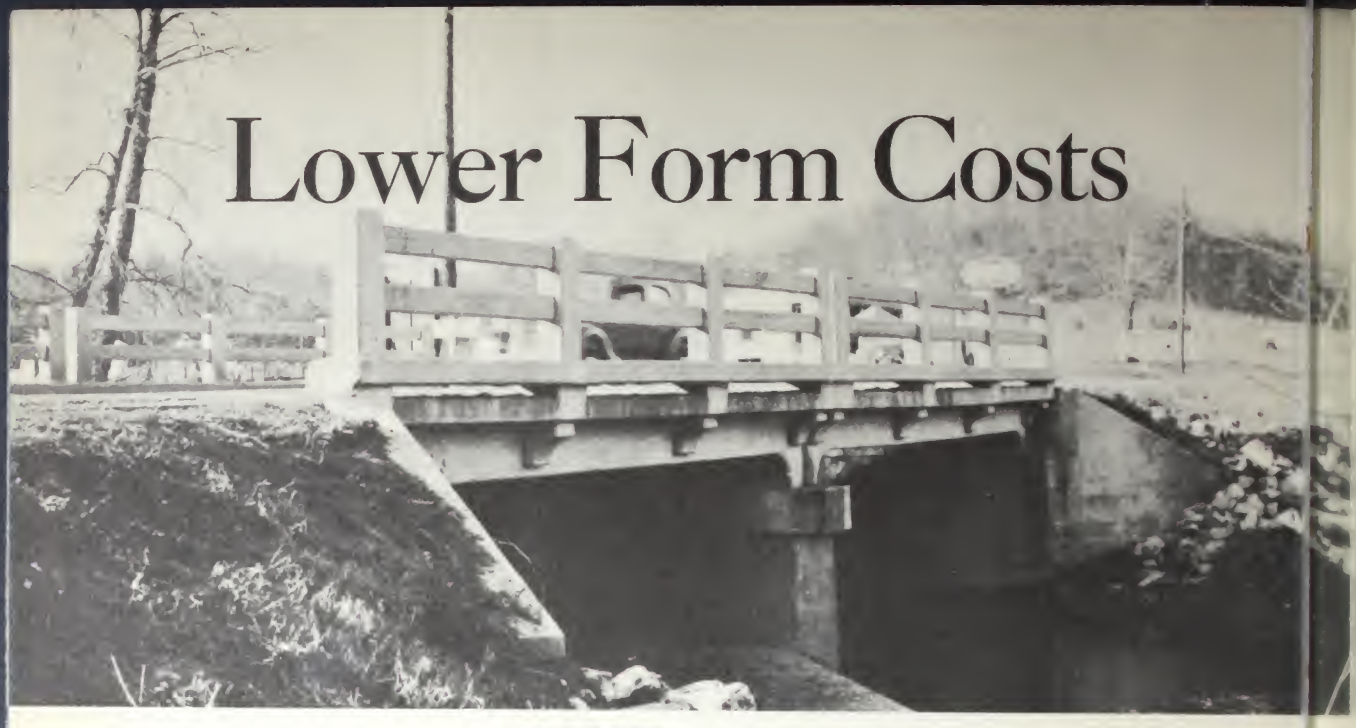
Lower Form Costs



When Pennsylvania's Highway Department relocated Lincoln Highway, east of Pittsburgh, a 600,000-cu. yd. fill, 120' high, had to be made across a narrow valley. 'Incor', used for two structures (one shown above), enabled contractor to start the fill 2 days after concreting began, advancing completion 2 months. Form sections were ready for re-use in 2 days instead of 14.

AS soon as concrete is self-supporting, forms are available for re-use, on duplicate parts of one structure or on similar parts of other structures. Because 'Incor' is self-supporting in one-fifth the usual time, one form-set frequently does the work of two or three with ordinary Portland cement.

Examples: In building several culverts of similar design, one well-made form-set, re-used two or three times, is decidedly cheaper than a flimsy set of forms thrown together for each job. The same thing is true on multiple-span bridges, where repeated use of one form-set is usually possible.

Well-made forms can be stripped without wrecking or excessive re-making cost. If a form-set is built in sturdy sections, which can be taken down and re-used without damage, lumber is saved and less labor is required.

Burlington Zephyr (right) on C. B. & Q. overpass built in mid-Winter at Laclede, Mo. 'Incor' piles were driven 3 days after casting, saving 2 weeks. Used on decks, 'Incor' substantially reduced form costs. Contractor saved $1,750—extra cost of 'Incor' was $102.50!

To facilitate heavy traffic on U. S. Route 1, south of Alexandria, Va., four reinforced concrete bridges (like one shown at left) were each widened 11'. Contracts required 60-day completion of each bridge. Contractor bid 'Incor' at same price as ordinary cement and got the job. 'Incor' helped 3 ways: (1) Contractor saved through earlier form re-use, faster cool-weather curing, steadier job progress; (2) he earned $310 in bonuses for early completion of 3 bridges; and (3) traffic hazard was removed one month sooner.

On jobs where form re-use is possible, 'Incor' lowers form-costs by as much as 50% to 70%—a saving no contractor can afford to overlook.

In a word, speed of erection no longer depends upon form multiplicity. Instead, it is based upon the efficiency of the contractor in organizing labor and equipment. Savings thus made possible may well equal the contractor's normal profit on a given job.

Above all, speed is not accompanied by the usual draw-backs: inferior work or increased construction costs. 'Incor' makes possible better work—at lower cost.

Relocation of U. S. Highway 71, Jackson County, Mo., required widening of drainage structures. To shorten detour time, 'Incor' was used in closing pavement gaps and in building a triple-box culvert. Low air temperatures required heating of mixing water and protection of concrete after placing. Heating units were cut to the bone; entire job was completed 36 days sooner than possible with ordinary cement.

On New York's Triborough Bridge, concrete piers for lift structure over Harlem River consist of four columns each 74' in height, with horizontal stiffening slabs 5' thick at four elevations. Contractor reduced form costs by first placing a 12" slab of 'Incor' concrete. 24 hours later, he poured 4" of ordinary concrete on the 'Incor' slab. By suspending forms from steel beams designed to carry the 12" slab, all shoring was eliminated. Forms, and grid from which they were suspended, were removed in 24 hours and used on other piers. Below, left, concrete pier; right, pouring 12" 'Incor' slab.

Piling Economies

'INCOR' piling has been driven 48 hours after casting; but 3 to 5 days is the usual time. Side forms are dropped and the pile rolled off the pallet in 24 hours.

While very long, slender piles require special handling precautions, piling made with 'Incor' 24-Hour Cement can usually be stacked or hauled in 24 to 48 hours, depending upon length of pile and pick-up employed.

Curing cost with 'Incor' is two-thirds less. More frequent re-use reduces by two-thirds the quantity of forms needed.

Casting is possible in a small area, without tiering or double-decking—so handling costs are 20% to 30% lower. Driving 18 to 25 days sooner reduces stockpile requirements 75%. Advanced completion reduces overhead. Less working capital is tied up.

Where test piling are required, work is advanced at least 36 days—because 18 to 25 days are saved both on test piling and on actual production. If driving equipment is rented or leased, the saving on this one item pays the extra cost of 'Incor'.

'Incor' produces required strengths with a normal cement content; the high shrinkage accompanying the use of rich mixes of ordinary cement is avoided. There is also less shattering, because piling is driven at an early age.

'Incor' piles (above) used for Erie R. R. viaduct, Elmira, N. Y., constructed in dead of Winter, were driven in hard soil when 3 days old. Contractor started pouring pier foundations 2 months earlier. 48-hour curing and earlier stripping meant one-half the forms required with ordinary cement. Job was run with stock of 75 piles—instead of 1500.

Where Louisiana's Air-Line Highway crosses Bonne Carre Spillway, 6,000 ft. of trestle were required. 'Incor' test piles saved 20 to 23 days. 922 piles, 75′ to 90′ long, 20″ square, driven 7 to 10 days after casting, were all pronounced perfect after rigid inspection. One form-set did the work of three; contractor reduced curing costs, simplified pile-yard operations.

Contract for approaches to Louisiana's Public Belt Bridge over Mississippi near New Orleans called for construction without tying up traffic on intersecting New Orleans-Baton Rouge Highway. Good planning plus 'Incor' Cement reduced detour travel to one short temporary section, and that for only 72 hours all told—saved several weeks' traffic disruption. Soft sub-grade meant 10 days' curing with ordinary cement—'Incor' was opened in 48 hours.

"The Public Be Pleased"

Bridge St. Bridge over Passaic River, Newark, carries 17,000 vehicles a day, 25% trucks. Floor repaving with ordinary cement meant closing bridge 14 days. Traffic interference had to be minimized, so 'Incor' was used. Bridge was closed only two days. Traveling public saved $32 for every dollar extra spent for 'Incor'.

OVER and above the gains to the contractor through reduced construction costs obtained with 'Incor,' there are equally important advantages from the standpoint of owner or public.

The simplest illustration is the toll bridge, where revenue begins as soon as the job is completed. Equally obvious are savings to railroads, through earlier elimination of 'slow order' operation and related advantages. Example: Bridges across streams usually come at bottom of grade. Slow orders, with reduced speeds down grade, mean use of pusher engines up grade or reduced train lengths. Earlier completion with 'Incor' means substantial operating economies, over and above the savings in actual construction.

The economics of 'Incor' high-early-strength concrete cut deep; they warrant a careful reappraisal of long-established practice. This is especially true in the case of highway projects. Here, however—unlike the toll bridge or the railroad—the user is the "general pub-

lic," a vague abstraction. The general public foots the bill for the improvement. But the individual car-owner cannot sharpen a pencil and figure out these indirect savings himself. It is up to the engineer and the contractor to do it for him.

Sometimes a merchant's association or a group of car-owners present the case of the general public. But the far-seeing engineer or contractor doesn't wait for that. Both realize that nothing makes money faster than a well-earned reputation for serving the public interest—first, last, and all the time.

And, in the final analysis, that is precisely what 'Incor' makes it possible to do.

(Above) Closing Broad Street Bridge in heart of Atlanta's shopping district meant heavy business loss. 'Incor' was used to deck slabs and parapets, and the bridge re-opened 8 days sooner than possible with ordinary cement. Cash value of trade lost prevented even many times 'Incor's slight extra cost.

(Below) Truck-hoisting began 7 hours after placing 'Incor' concrete on Pennsylvania R. R.'s Anacostia River Bridge, Washington, D. C. 'Incor' saved 14 days; cut winter housing and protection expense; reduced contractor's costs at least $10,000. Earlier "slow setter" construction caused P. R. R. many times that amount.

SUMMARY OF SAVINGS

Concrete has three principal characteristics—Strength, Durability, Economy. 'Incor' 24-Hour Cement offers distinct and important advantages in all three:

STRENGTH: Because it is service-strong or self-supporting in 24 to 48 hours, 'Incor'—

1. Speeds up work: No barricaded concrete to get in the way of workmen; no switching men from one job to another. Freshly-placed concrete no longer holds up following operations.

2. Reduces form costs: Form removal in 24 to 48 hours means earlier re-use; material and labor costs reduced 60% to 70%.

3. Removes damage hazards: Structure is self-supporting days sooner; high-water, weather and other hazards minimized.

4. Cuts curing costs: Does away with 75% of the curing operation; saves labor, pipe lines, pumping equipment. Makes thorough curing easier, more certain. Winter heat-curing and protection costs reduced by 60% to 75%.

5. Lowers overhead: Increased rate of production means lower job overhead; more output with same equipment and working capital.

DURABILITY: By curing thoroughly in the short time concrete can be kept wet, 'Incor' means—

1. Stronger, denser, more watertight concrete: 24 to 48 hours with 'Incor' equals 5 to 10 days' curing with ordinary Portland cement;

2. Better quality concrete: Well-cured concrete resists wear and erosion—gives better service.

ECONOMY: In addition to the economies obtained through rapid hardening, 'Incor' also makes a smoother-working mix that is easier to handle and place. 'Incor' holds concrete together during handling, insures a more uniform mass, free from honeycomb.

To sum it all up—'Incor' produces stronger, more durable concrete—at a distinct cost saving. Hence, this suggestion:

*Figure 'Incor' on your next job, large or small, regardless of whether it is "rush" or not. Figure 'Incor'*against ordinary Portland cement—and may the 'best man' win!*

*Reg U S Pat Off

This intersection of two Michigan super-highways is as near accident-proof as man can make it. Telegraph Road—main artery from Flint and Detroit to Toledo, carrying 8,400 vehicles a day—crosses Base Line Road, daily traffic count, 2,000 vehicles. 'Incor', used for piling for two bridges, got work started earlier and reduced cold-weather costs. Freezing temperatures failed to slow operations. 'Incor' ended detour weeks sooner.

Grade Separation

'INCOR' REDUCES THE COST—DECREASES THE HAZARD

Lombardy Street underpass, Richmond, Va. (right), carries heavy Richmond, Fredericksburg & Potomac R.R. traffic over a busy downtown traffic artery. Constructed in mid-Winter, 'Incor' was used in abutments and deck. Train traffic was put over the deck within 3 days after each pour; cold-weather curing costs were reduced; earlier use of underpass for vehicular traffic relieved congestion.

'Incor' hastens completion of grade-separation projects, removes the hazard weeks sooner. Detours are unnecessary except where short, paved side-roads are available or where heavy excavation is required. Besides promoting public safety, 'Incor' substantially reduces costs. Example, forms are stripped in 24 to 48 hours—one set does the work of two or three with ordinary cement. (Left) Tipton Street underpass, Huntington, Ind., where 'Incor' advanced completion three weeks, ended hazard that much sooner.